WHAT IS CLAIMED IS:

1. A nucleic acid which comprises a polynucleotide that encodes a fusion polypeptide, wherein the fusion polypeptide comprises:

a) a catalytic domain of a glycosyltransferase; and

b) a catalytic domain of an accessory enzyme which catalyzes a step in the formation of a nucleotide sugar which is a saccharide donor for the glycosyltransferase.

2. The nucleic acid of claim 1, wherein the glycosyltransferase is a eukaryotic glycosyltransferase.

3. The nucleic acid of claim 1, wherein the accessory enzyme is a eukaryotic accessory enzyme.

4. The method of claim 2, wherein the catalytic domain of the glycosyltransferase substantially lacks one or more of a cytoplasmic domain, a signal-anchor domain, and a stem region of the glycosyltransferase.

5. The nucleic acid of claim 1, wherein the glycosyltransferase is a prokaryotic glycosyltransferase.

6. The nucleic acid of claim 1, wherein the accessory enzyme is a prokaryotic accessory enzyme.

7. The nucleic acid of claim 1, wherein the fusion polypeptide further comprises a catalytic domain of a second accessory enzyme.

8. The nucleic acid of claim 1, wherein the glycosyltransferase is selected from the group consisting of sialyltransferases, *N*-acetylglucosaminyltransferases, *N*-acetylgalactosaminyltransferases, fucosyltransferases, galactosyltransferases, glucosyltransferases, glucuronosyltransferases, xylosyltransferases, and mannosyltransferases.

9. The nucleic acid of claim 1, wherein the accessory enzyme is selected from the group consisting of:

a GDP-mannose dehydratase, a GDP-mannose 3,5-epimerase, and a GDP-mannose 4-reductase;

a UDP-glucose 4' epimerase;

a UDP-GalNAc 4' epimerase;

a CMP-sialic acid synthetase;

a neuraminic acid aldolase;

an *N*-acetylglucosamine 2' epimerase;

a phosphate kinase selected from the group consisting of a pyruvate kinase, a myokinase, a creatine phosphate kinase, an acetyl phosphate kinase, and a polyphosphate kinase; and

a pyrophosphorylase selected from the group consisting of a UDP-Glc pyrophosphorylase, a UDP-Gal pyrophosphorylase, a UDP-GalNAc pyrophosphorylase, a GDP-mannose pyrophosphorylase, a GDP-fucose pyrophosphorylase, and a UDP-GlcNAc pyrophosphorylase.

10. The nucleic acid of claim 1, wherein the nucleotide sugar is selected from the group consisting of GDP-Man, UDP-Glc, UDP-Gal, UDP-GlcNAc, UDP-GalNAc, CMP-sialic acid, GDP-Fuc, and UDP-xylose.

11. The nucleic acid of claim 1, wherein the glycosyltransferase is a sialyltransferase and the nucleotide sugar is CMP-sialic acid.

12. The nucleic acid of claim 11, wherein the accessory enzyme is a CMP-sialic acid synthetase.

13. The nucleic acid of claim 11, wherein the accessory enzyme is a neuraminic acid aldolase or an *N*-acetylglucosamine 2' epimerase.

14. The nucleic acid of claim 1, wherein the glycosyltransferase is a galactosyltransferase and the nucleotide sugar is UDP-galactose.

15. The nucleic acid of claim 14, wherein the accessory enzyme is a UDP-glucose 4' epimerase.

16. The nucleic acid of claim 1, wherein the glycosyltransferase is a fucosyltransferase and the nucleotide sugar is GDP-fucose.

17. The nucleic acid of claim 16, wherein the accessory enzyme is selected from the group consisting of a GDP-mannose dehydratase, a GDP-mannose 3,5-epimerase, a GDP-fucose pyrophosphorylase, and a GDP-mannose 4-reductase.

18. The nucleic acid of claim 1, wherein the glycosyltransferase is an *N*-acetylgalactosaminyltransferase and the nucleotide sugar is UDP-GalNAc.

19. The nucleic acid of claim 18, wherein the accessory enzyme is a UDP-GalNAc 4' epimerase.

20. The nucleic acid of claim 1, wherein the glycosyltransferase is an *N*-acetylglucosaminyltransferase and the nucleotide sugar is UDP-GlcNAc.

21. The nucleic acid of claim 20, wherein the accessory enzyme is a UDP-GalNAc 4' epimerase.

22. The nucleic acid of claim 1, wherein the glycosyltransferase is a mannosyltransferase and the nucleotide sugar is GDP-Man.

23. The nucleic acid of claim 1, wherein the fusion polypeptide further comprises a linker peptide between the glycosyltransferase catalytic domain and the accessory enzyme catalytic domain.

24. The nucleic acid of claim 1, wherein the nucleic acid further comprises a polynucleotide that encodes a signal sequence which is linked to the fusion polypeptide.

25. The nucleic acid of claim 1, wherein the nucleic acid further comprises a polynucleotide that encodes a molecular tag which is linked to the fusion polypeptide.

26. An expression vector which comprises a nucleic acid of claim 1.

27. A host cell which comprises a nucleic acid of claim 1.

28. A fusion polypeptide encoded by a nucleic acid of claim 1.

29. A fusion polypeptide that comprises:

a) a catalytic domain of a glycosyltransferase; and

b) a catalytic domain of an accessory enzyme which catalyzes a step in the formation of a nucleotide sugar which is a donor for the glycosyltransferase.

30. The fusion polypeptide of claim 29, wherein the catalytic domain of the glycosyltransferase is joined to the carboxy terminus of the accessory enzyme catalytic domain.

31. The fusion polypeptide of claim 29, wherein the glycosyltransferase is a galactosyltransferase and the accessory enzyme is a UDP-glucose 4' epimerase.

32. The fusion polypeptide of claim 29, wherein the glycosyltransferase is a sialyltransferase and the accessory enzyme is a CMP-sialic acid synthetase.

33. A method of producing a fusion polypeptide that comprises:

a) a catalytic domain of a glycosyltransferase; and

b) a catalytic domain of an accessory enzyme which catalyzes a step in the formation of a nucleotide sugar which is a donor for the glycosyltransferase;

wherein the method comprises introducing a nucleic acid that encodes the fusion polypeptide into a host cell to produce a transformed host cell; and culturing the transformed host cell under conditions appropriate for expressing the fusion polypeptide.

34. The method of claim 33, wherein the fusion polypeptide is purified following its expression.

35. The method of claim 33, wherein the host cell is permeabilized following expression of the fusion polypeptide.